What is claimed is:

1. An elastic wave generator comprising:

an excitation coil;

a magnetostriction oscillator around which the excitation coil is wound and made of a lamination of magnetostriction sheets having a metallic crystalline structure which exhibits positive strain characteristics in which its length varies directionally upon magnetic excitation; and

an oscillator support having a first support surface shrink-fit against a first end surface of said magnetostriction oscillator intersecting the direction along which the length of the magnetostriction oscillator changes and a second support surface shrink-fit against a second end surface of the magnetostriction oscillator intersecting the direction along which the length of said magnetostriction oscillator changes, whereby the changes in the length of said magnetostriction oscillator due to the magnetic excitation of said excitation coil appearing at said first and second end surfaces is directly supported by said first and second support surfaces.

2. An elastic wave generator comprising:

an excitation coil;

a magnetostriction oscillator around which said excitation coil is wound and made of a lamination of magnetostriction sheets having a metallic crystalline structure which exhibits positive strain characteristics in which its length varies directionally upon magnetic excitation;

a magnetic bias device having a magnetic path in common with said magnetostriction oscillator; and

an oscillator support having a first support surface shrink-fit against a first end surface of said magnetostriction oscillator intersecting the direction along which the length of said magnetostriction oscillator changes and a second

support surface shrink-fit against a second end surface of said magnetostriction oscillator intersecting the direction along which the length of said magnetostriction oscillator changes, whereby the changes in the length of said magnetostriction oscillator due to the magnetic excitation of said excitation coil appearing at said first and second end surfaces is directly supported by said first and second support surfaces.

3. An elastic wave generator as claimed in claim 1, wherein substantially all of magnetostriction amount generated in said magnetostriction oscillator upon excitation of said excitation coil becomes an internal stress at a shrink-fit intersurface between said first and second end surfaces of said magnetostriction oscillator and said first and second support surfaces of said oscillator support.

4. An elastic wave generator as claimed in claim 1, wherein the amount of the internal stress at the shrink-fit interface between the shrink-fit first end surface of said magnetostriction oscillator and said first support surface of said oscillator support as well as the amount of the internal stress at the shrink-fit interface between the shrink-fit second end surface of said magnetostriction oscillator and said second support surface of said oscillator support are an initial set compression stress required to said magnetostriction oscillator.

5. An elastic wave generator as claimed in claim 2, wherein the amount of the internal stress at the shrink-fit interface between the shrink-fit first end surface of said magnetostriction oscillator and said first support surface of said oscillator support as well as the amount of the internal stress at the shrink-fit interface between the shrink-fit second end surface of said magnetostriction oscillator and said second support surface of said oscillator support are such a stress of the extent that provides, together with the magnetic bias by said

magnetic bias device, an initial set compression stress required to said magnetostriction oscillator.

6. An elastic wave generator as claimed in claim 1, wherein a shrink-fit interface between said first end surface of said magnetostriction oscillator and said first support surface of said oscillator support as well as a shrink-fit interface between said second end surface of said magnetostriction oscillator and said second support surface of said oscillator support are provided by elavating the temperature of said magnetostriction oscillator after said magnetostriction oscillator cooled under the cryogenic environment is installed between said first and second support surfaces of said oscillator support.

7. An elastic wave generator as claimed in claim 1, wherein a shrink-fit interface between said first end surface of said magnetostriction oscillator and said first support surface of said oscillator support as well as a shrink-fit interface between said second end surface of said magnetostriction oscillator and said second support surface of said oscillator support are provided by lowering the temperature of said oscillator support after said oscillator support heated under the elevated temperature environment is installed between said first and second support surfaces of said oscillator support.

8. An elastic wave generator as claimed in claim 1, wherein said magnetostriction oscillator is made by bonding said magnetostriction sheets to each other by a pardonable material into an integral structure of the lamination of said magnetostriction sheets.

9. An elastic wave generator as claimed in claim 1, wherein said oscillator support has formed therein a pocket, said pocket having a first wall surface which intersects with the direction along which the length of said oscillator

changes and which serves as one of the support surfaces of the oscillator support, and said pocket having a second wall surface which opposes said first wall surface and intersects with the direction along which the length of said oscillator changes.

10. An elastic wave generator as claimed in claim 1, wherein said oscillator support is made of a material having a coefficient of thermal expansion substantially equal to that of said magnetostriction support.

11. An elastic wave generator as claimed in claim 1, wherein said magnetostriction oscillator is made by bonding said magnetostriction sheets to each other by a pardonable material into an integral structure of the lamination of said magnetostriction sheets; said oscillator support is made of a material having a coefficient of thermal expansion substantially equal to that of said magnetostriction support; and the amount of the internal stress at the shrink-fit interface between the shrink-fit first end surface of said magnetostriction oscillator and said first support surface of said oscillator support as well as the amount of the internal stress at the shrink-fit interface between the shrink-fit second end surface of said magnetostriction oscillator and said second support surface of said oscillator support are an initial set compression stress required to said magnetostriction oscillator.

12. An elastic wave generator as claimed in claim 2, wherein said magnetostriction oscillator is made by bonding said magnetostriction sheets to each other by a pardonable material into an integral structure of the lamination of said magnetostriction sheets; said oscillator support is made of a material having a coefficient of thermal expansion substantially equal to that of said magnetostriction support; and the amount of the internal stress at the shrink-fit interface between the shrink-fit first end surface of said magnetostriction oscillator

and said first support surface of said oscillator support as well as the amount of the internal stress at the shrink-fit interface between the shrink-fit second end surface of said magnetostriction oscillator and said second support surface of said oscillator support are such a stress of the extent that provides, together with the magnetic bias by said magnetic bias device, an initial set compression stress required to said magnetostriction oscillator.

13. An elastic wave generator as claimed in claim 1, wherein a spacer of a non-magnetic material is disposed between a support surface of the oscillator support and the magnetostriction oscillator.

14. An elastic wave generator as claimed in claim 1, wherein an excitation current supplying device for energizing the excitation coil is provided, said excitation current supplying device having an output therefrom that can be controlled by a sensor output.

15. A magnetostriction oscillator mounting structure for mounting a magnetostriction oscillator to an object to which an elastic wave is irradiated, said magnetostriction oscillator comprising an excitation coil wound around a stack of thin sheets of a metallic magnetostriction material bonded together with an electrically insulating bonding agent for generating an elastic wave in the direction parallel to said thin sheet by an excitation current flowing through said excitation coil;

said magnetostriction oscillator having two parallel surfaces intersecting at right angles with an elastic wave radiation direction and spaced apart from each other by a distance A at room temperature and a distance A1 at a lower temperature;

said object having a hole or a recess having two parallel wall surfaces intersecting at right angles with said elastic wave radiation direction and spaced

apart from each other by a distance B at room temperature;

a relationship among said distances being A > B > A1; and

said magnetostriction oscillator being held in said hole or recess by the shrink-fit against said wall surfaces in which said magnetostriction oscillator is cooled and contracted and then returning to room temperature to expand said magnetostriction oscillator within said hole or recess.

16. A magnetostriction oscillator mounting structure as claimed in claim 15, wherein said object is a non-magnetic body.

17. A magnetostriction oscillator mounting structure as claimed in claim 16, wherein said object is a tubular body.

18. A magnetostriction oscillator mounting structure as claimed in claim 17, wherein said thin sheet of a metallic magnetostriction material is a bent sheet having a radius of curvature substantially equal to that of the surface of said tubular body.

19. A magnetostriction oscillator mounting structure as claimed in claim 17, wherein said recess comprises a circumferential groove extending over the entire circumference of said tubular body.

20. A magnetostriction oscillator mounting structure as claimed in claim 17, wherein said tubular body is a drill pipe for digging.

21. A magnetostriction oscillator mounting structure as claimed in claim 15, wherein a non-magnetic spacer is provided between said support wall surface of said oscillator support and said magnetostriction oscillator.

22. A method for mounting a magnetostriction oscillator to an object to which an elastic wave is irradiated, said magnetostriction oscillator comprising an excitation coil wound around a stack of thin sheets of a metallic magnetostriction material bonded together with an electrically insulating bonding agent for generating an elastic wave in the direction parallel to said thin sheet by an excitation current flowing through said excitation coil; the method comprising:

a magnetostriction oscillator shaping step for shaping two opposing elastic wave radiation surfaces formed by stacking said thin sheets into two parallel surfaces intersecting at right angles with an elastic wave radiation direction and spaced apart from each other by a distance A at room temperature;

an object shaping step for providing a hole or a recess having two parallel wall surfaces intersecting at right angles with said elastic wave radiation direction and spaced apart from each other by a distance B at room temperature between two wall surfaces at room temperature which is smaller than the distance A;

a cooling step for cooling said magnetostriction oscillator until said distance A becomes equal to a distance A1 smaller than said distance B of said hole or said recess; and

an insertion step for inserting the cooled magnetostriction oscillator into said hole or recess.

23. A method for mounting a magnetostriction oscillator as claimed in claim 22, wherein said cooling step is carried out by liquid nitrogen.

24. A method for mounting a magnetostriction oscillator as claimed in claim 23, wherein the distance B of said hole or said recess at room temperature is larger than the distance A1 of the magnetostriction oscillator upon cooled by liquid nitrogen and is smaller than a distance A2 of said hole or said recess upon the application of a magnetic bias at room temperature.

25. A method for mounting a magnetostriction oscillator as claimed in claim 22, wherein said step of inserting said magnetostriction oscillator into said recess of said oscillator support comprises a step of inserting a non-magnetic spacer into said recess.